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ABSTRACT

The purpose of this study was to investigate class differences in the responses of infants to tape recordings of mothers' and strangers' voices. Subjects were 10-month-old first-born Caucasian girls, 30 from middle class families and 30 from working class families. Stimuli presented through a speaker placed in front of the infant consisted of taped passages read by the subject's own mother, and by a stranger from her own social class group. Codings were made of each subject's vocalizations, smiling, looking at speaker baffle, looking at mother, and looking at coder. Two additional measures taken were heartrate deceleration and physical activity. Middle class infants responded differentially to the two stimuli, while working class infants did not. The most dramatic differences involved the infants' looking behaviors. Middle class infants looked more at their mothers after hearing their mother's voice, and more at the coder following the stranger's voice, which may be related to the fact that these infants have experienced more verbal stimulation from their mothers at home. The present findings are consistent with previous investigations of infant reaction to language stimuli. [Not available in hard copy due to marginal legibility of original document.] (NH)

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Infants Reactions to Mother's Voice and Stranger's Voice: Social Class Differences in the First Year of Life[1]

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Psychologists have paid insufficient attention to language development during the first year of life (Friedlander, 1968, 1970) primarily because of difficulties in assessing pre-verbal behavior. However, a series of recent studies (Friedlander, 1968; Kagan, in press; Turnure, 1971) developed new procedures, and successfully examined some of the dimensions of early language-related behaviors. The present study utilized these techniques to investigate social class differences in infants' responses to tape-recorded passages containing mother's voice and stranger's voice.

Studies of social class differences in infant development have been limited by the narrow range of infant behaviors which have been assessed. Thus Golden and Birns' (1969) statement that there is "not a single published study in the psychological literature in which there is any evidence of social class differences in intellectual performance earlier than the third year of life" may simply reflect the insensitivity of our assessment procedures. The decision to examine class differences in language-related behaviors in the present study stems from reports that middle-class mothers have been found to engage in more "distinctive" or more "meaningful" verbal interchanges with their children than working class mothers (Hess and Shipman, 1965; Levine, Fishman, and Kagan, 1967), and that class differences in infants' vocalization rates have also been reported. Irwin (1948), for example, found that infants under one year

of age who came from "professional and business" families vocalized more, and employed more different sounds than children from lower class homes. In longitudinal studies, Moore (1968) found an increasing association between social class and speech development (among girls only) during the first year of life; and Kagan (in press) found that upper-middle-class girls showed a 50% increase in vocalization from 8 to 13 months of age, while lower-middle-class girls showed essentially no increase at all. The importance of early vocalization rates is reflected in several recent studies which have reported high correlations between infant vocalization and later intelligence. Moore (1967) found that the "speech quotient" of six-month-old girls was significantly correlated with vocabulary at three years of age ($p < .01$), and the speech quotient of 18-month-old girls was correlated with vocabulary scores of eight-year-old girls (the oldest Moore tested). Similarly, Bayley (1968) reported a correlation of .80 between girls' vocalization scores during the first year of life and Wechsler-Bellevue Verbal IQ at 26 years of age.

Method

Subjects were 60 first-born Caucasian girls, ten months of age, who were part of a larger investigation (Tulkin, 1970). Thirty infants came from middle-class families and 30 from working-class families. Middle class was defined as (a) one or both parents having graduated from college and (b) the father working in a professional job. Working class was defined as (a) either one or both parents having dropped out of high school (but neither having any college) or (b) the father working in a semi-skilled or unskilled job. Premature infants and infants with abnormal

medical histories were excluded.[2]

Subjects were seated in a high chair in front of a three-sided stimulus board (see Figure One). Their mothers sat behind them on their right, and a coder sat behind them on their left. A second coder stood behind the stimulus board and observed the subject through tinted plastic windows. Stimuli were presented through a speaker situated in front of the infant, and slightly to her right. Stimulus passages consisted of twenty-second tape-recorded passages containing a standard "fairy tale" read by the subject's own mother and by a stranger. Every subject heard the voice of a different stranger from her own social class group. Mother's voice and stranger's voice were presented alternately (four times each) for 20 seconds, separated by a 10 second interstimulus interval. There was a break between the first four stimuli (Series One) and the remaining four stimuli (Series Two) during which other procedures--not examined in the present report--were administered. Observers coded the subjects' vocalizations, smiling, looking at the speaker baffle, looking at the mother, and looking at the coder. Reliabilities based on 20 pre-test infants (not included in the study) were all above .90. In addition to the variables recorded by the coders, two additional measures were taken: Heartrate deceleration and physical activity.[3] Activity was further divided into two sub-categories: 1) Differences in activity were defined by comparing movement during two particular stimuli (e.g., mother's voice and stranger's voice) to determine if the infants were less active during one of the stimuli; and 2) Quieting was defined by comparing activity prior to a stimulus with activity during the same stimulus to determine if the infants decreased activity (i.e. attended) to a particular stimulus.

Results

Comparisons of the infants' responses to mother's and stranger's voices suggested that the middle-class infants differentially responded to the two stimuli, while the working-class infants did not. Differences were not observed on all variables, however. Frequencies of smiling and looking at the speaker baffle were too low to analyze differences. There was no difference in the infants' vocalization or movement during the mother's voice passages, compared to the stranger's voice passages; nor was there a difference in heartrate deceleration to the two passages.[4] Other variables did yield significant differences. In Series One, middle-class infants quieted more to the passages containing mother's voice than to the passages containing stranger's voice, while the working-class infants did not respond differentially (the second order comparison yielded a significant difference, $p = .058$). Middle-class infants also vocalized more <u>following</u> the passages containing mother's voice than following the passages containing stranger's voice (second order comparison yielded significance level of .090). These two differences were not found in Series Two, possibly because the infants became restless and cranky, and thus their physical activity and vocalizations were less likely to be related to the stimuli.

The most dramatic differences, however, involved the infants' looking behaviors. Middle-class infants, compared to their working-class counterparts, looked more at their mothers after hearing their mother's voice ($p = .003$ for the mean of the four passages containing mother's voice), and more at the coder following the four presentations of stranger's voice ($p = .070$). Figure Two clearly illustrates the class

differences in looking behaviors. Middle-class infants (represented by the solid line) looked more at the coder following the stranger's voice passages, and were less likely to look at the coder following the mother's voice passages. Working class infants did not show this pattern.

The tendency for middle-class infants to look at the "correct" person following termination of the passages was found in Series Two as well as in Series One, despite the infants' increased restlessness. The correlation between looking at the "correct" person following the passages in Series One and Series Two was .516 ($p < .01$) for the middle-class infants, but only .029 for the working-class infants. Correlations were also computed among different infant responses within each social class group, and some interesting differences were found here also. Middle-class infants who looked more at their mothers following the mother's voice passages in Series One quieted more while listening to those passages ($r = .316$, $p < .10$); the correlation for working class subjects was -.094. Thus not only was there evidence for class differences on specific responses to the stimuli, but, in addition, there seemed to be a more meaningful interrelationship among responses in the middle-class sample.

Discussion

The present findings are consistent with other investigations of infants reactions to language stimuli. Turnure (1971) found greater motor quieting to mother's voice passages with age, and concluded that infants were increasingly attentive to the stimuli. The present data also point to the importance of motor quieting as an index of attention

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to auditory stimuli.

The importance of the infants' looking responses has also been emphasized by other investigators. Kagan (in press) presented meaningful and non-meaningful speech passages to a group of eight-month-old infants, and found that "upper-middle-class" infants looked longer at the speaker baffle than infants from other social class groups following the high meaning-high inflection stimulus. Both Kagan's subjects and the present subjects seemed to be searching for the source of the meaningful speech. Since there was no stranger visible to the infants in Kagan's experiment, their looking at the speaker baffle paralleled the middle-class infant's looking at the "correct person" in the present study. Other investigators have also noted that infants who are infrequently exposed to verbal stimulation do not search for the source of an auditory stimulus. Dennis and Najarian (1967) reported that the most dramatic deficiency among the institutionalized infants they observed was that the infants did not turn to the source of a sound. The same finding was recently reported to the author by Bettye Jean Forrester who is conducting a study with lower income infants in Nashville, Tennessee.

Further evidence for the importance of looking for the source of auditory stimuli comes from the finding that infants tested in experimental procedures in which they could not search for their mothers upon hearing her voice have begun to cry (Laroche and Tcheng, 1963; Turnure, 1971). Turnure hypothesized that the distress developed because "the infants' usual responses to his mother were contingent...on more of her attributes being perceived than just her voice." More research is necessary to understand this phenomenon more completely, but one cannot resist noting

the similarity between these findings and Hebb's (1946) classic study of the nature of fear, which demonstrated that a familiar stimulus which is missing some of its critical elements is likely to elicit fear.

The present findings are important in that they demonstrate that with more refined assessment procedures, social class differences--or, more correctly, the effects of experience--can be examined in the first year of life. The greater differential responding to mother's and stranger's voices by the middle-class infants is likely related to the fact that these infants have experienced more verbal stimulation from their mothers at home--quantitatively in the form of more frequent maternal vocalization, and qualitatively in the form of distinct face-to-face verbalization and reciprocal vocalizations (Tulkin and Kagan, 1970). Correlations between the previously reported home observations and the laboratory findings reported in the present paper are only suggestive, however. None of the home observation variables was correlated with the differential looking behaviors, but some of the maternal verbal behaviors at home were correlated with differential vocalizations following mother's and stranger's voices. Distinct face-to-face vocalization at home and differential vocalization following the first presentation of mother's and stranger's voices yielded correlations of .464 ($p < .05$) for middle-class subjects and .444 ($p < .05$) for working-class subjects. These data, as well as reports from other laboratories, emphasize the importance of exploring language-related behaviors in the first year of life, and attempting to understand the relationships between these behaviors and infants' experiences.

Footnotes

[1]Paper presented at meeting of the Society for Research in Child Development, Minneapolis, April, 1971. These findings are based on a doctoral dissertation submitted to the Department of Social Relations, Harvard University. The research was supported by a grant to Jerome Kagan from the National Institute of Mental Health, and by a grant to the author from the National Science Foundation.

[2]Complete information on subject selection, reliability of observations, and other methodological information can be found in Tulkin (1970).

[3]Heartrate was recorded by a Grass polygraph equipped with a Lexington Instruments Cardio-Tachometer. The magnitude of the deceleration was computed by taking the mean of the three lowest beats during the five seconds before the onset of the stimulus and subtracting from that value the mean of the three lowest beats during the first five seconds of the stimulus period. If there was no difference in the values, or if the "stimulus" value was greater than the "pre-stimulus" value, the deceleration score was coded zero.

Activity was measured by a stabilimeter which was also connected to the polygraph. The instrument was sensitive only to movements of the top half of the infant's body. By emitting a high frequency sound wave and measuring the amount of time taken by the wave to bounce off the subject and return to a receiver on the stabilimeter, the instrument determined the distance between receiver and the child. Since every movement of the child involved a change of distance, movement was reflected in the stabilimeter output. Reduction of the stabilimeter data consisted of

counting the number of seconds during each stimulus in which the polygraph pen moved an arbitrary distance (equal to the child's moving a distance of approximately one foot).

[4]In addition to the analyses presented thus far which compared all subjects in each social class group, additional analyses were done on "extremes." The upper extreme included 22 middle-class families in which both parents had graduated from college, while the lower extreme included 12 working-class families in which neither parent had graduated from high school. Infants in the "upper extreme" group did show larger heartrate decelerations to the initial presentation of mother's voice than did infants in the "lower extreme" group ($p = .08$).

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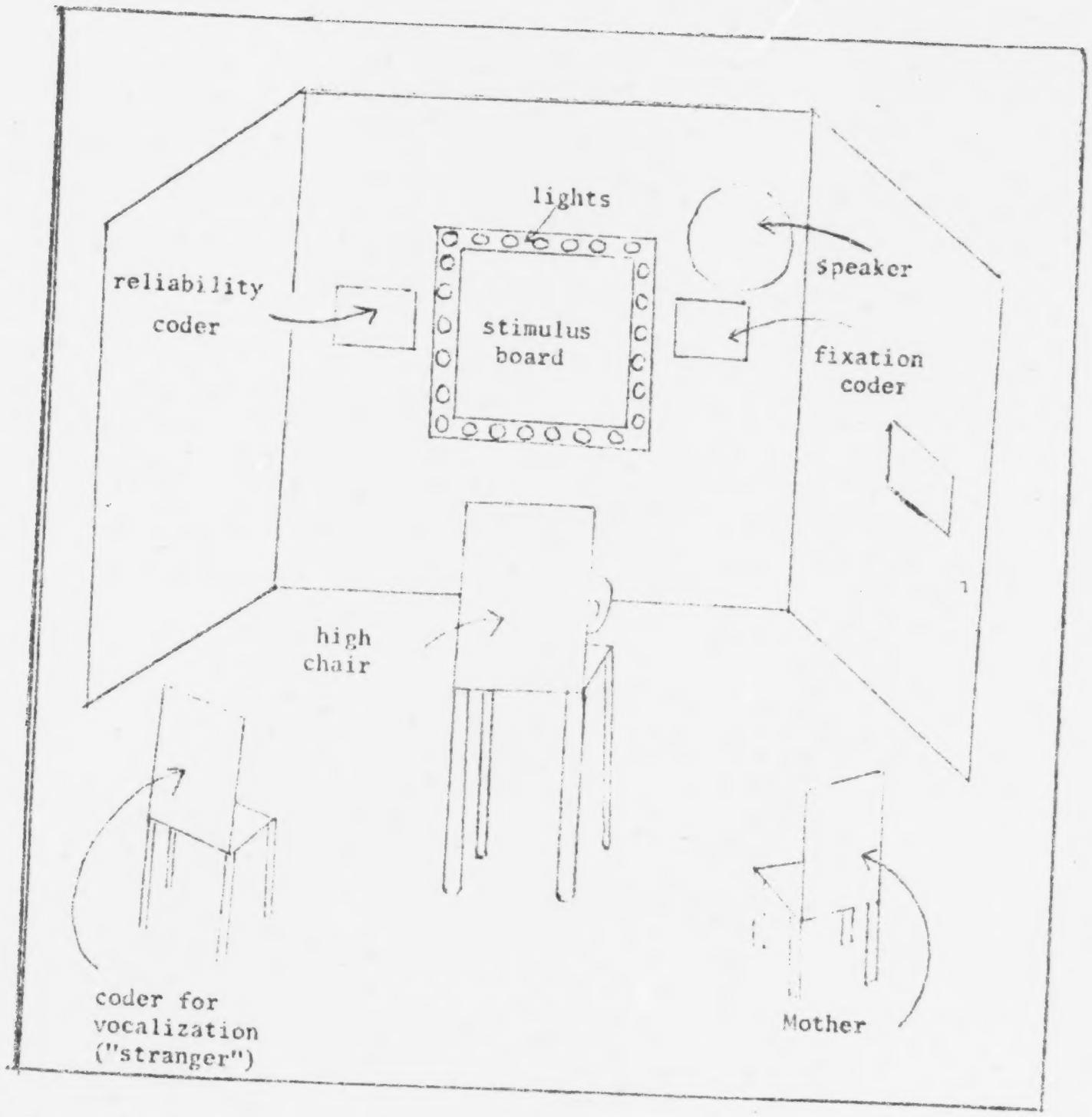

Figure One. Schematic sketch of arrangement of Laboratory

Figure Two

MOTHER-STRANGER PASSAGES
LOOK AT STRANGER, OFF